Coordinated Regional Downscaling Experiment (CORDEX)

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CORDEX Scientific Vision

To advance and coordinate the science and application of regional climate downscaling through global partnerships

Goals:

- To better understand relevant regional/local climate phenomena, their variability and changes, through downscaling.
- To evaluate and improve regional climate downscaling models and techniques
- To produce coordinated sets of regional downscaled projections worldwide
- To foster communication and knowledge exchange with users of regional climate information
CORDEX – Scientific Challenges

✧ **Added value**

Internal variability & added value as functions of scale; Bias correction uncertainties and consistency; User-oriented metrics

✧ **Human element**

Coupling of regional climate and coastal megacities; Bridging with urban parameterisation development; Land use change

✧ **Coordination of regional coupled modelling**

Ocean-ice-atmosphere; Lakes; Dynamic land surface; Cryosphere; Natural fires; Atmospheric chemistry; Carbon cycle; Aerosols; Marine biogeochemistry

✧ **Precipitation**

Convective systems; Coastal storm systems; MJO/Monsoon

✧ **Local wind systems**

Wind storms; Strong regional winds; Wind energy
Goal:
Promote the CORDEX vision to advance and coordinate the science and application of regional climate downscaling through global partnerships

Focus:
- Analysis guided by CORDEX Science Goals.
- High resolution climate information
- Applications to VIA community and other end users

- Over 350 registered
- Special event for Early Career Scientists
- European Climate Research Alliance (ECRA) side event
- Conference report online – November 2016

http://www.icrc-cordex2016.org/
CORDEX Regions

**Goals:**
- Cover all major land masses + Arctic
- Build on prior experiences with regional simulations and processes
CORDEX Workshops/Meetings

- **CORDEX Africa** Analysis workshops 3, Cape Town, February 2016
- **SEACLID/CORDEX-SEA** Progress Meeting, Jakarta, Indonesia, September 2016
- **SEACLID/CORDEX SEA** 4th Workshop, Hanoi, November 2016
- **Arctic CORDEX** meeting, Bergen, Norway November 2016
- Meeting on **Convection Permitting CORDEX FPS**, ICTP, Trieste, November 2016
- **Euro-CORDEX GA**, Hamburg, Germany, January 2017
- **CORDEX Australasia** meeting, February 2017
- Presentation of **CORDEX at CliC SSG**, Wellington, New Zealand, February 2017
CORDEX-Related Events

- Scoping a Framework for WCRP Regional Activities, Hamburg, Germany, October 2016
- CORDEX African Atlas presentation at Cop22/UNFCCC, Marrakech, Morocco, November 2016
- Formation of Asian ESD-CORDEX group, Hanoi, November 2016
- Special Session at UGM, Puerto Vallarta, Mexico. SE13: Modelación Regional del Clima, Nov 2016
- 2nd Workshop on Climate Change, Variability, and Modeling over Central America and Mexico, San José, Costa Rica, November 2016
- Climate Services conference, Cape Town, February-March 2017
- WMO Workshop: Climate Services Information System Operations and Coordination, Nanjing, March 2017

“Leg 1”
Foundational Climate Science
(Curiosity-driven research/Fundamental knowledge)

“Leg 2”
Application-inspired Climate Science

“Leg 3”
Transdisciplinary Engagement

Discussions with World Bank
Coupling with several WCRP activities
CORDEX – Scientific Challenges

★ Added value


Di Luca et al. (*JGR-Atmos.*, 2016) Quantifying the overall added value of dynamical downscaling and the contribution from different spatial scales.
CORDEX – Scientific Challenges

✧ Human element

CORDEX – Scientific Challenges

Coordination of regional coupled modelling


July 1994 & 1995 diurnal cycle
CORDEX – Scientific Challenges

Ɐ Local wind systems


Based on 2050 wind turbine deployment ➔
Flagship Pilot Studies (FPS)

- Coordinate developments in conv.-permitting climate sim.
- Should have strong basis in
  - Fine-scale processes important to region’s climate (physical basis)
  - Observational basis for verification (analysis basis)
  - User applications (VIA basis)
- Potential connection with other WCRP programs, esp. GEWEX
- First FPS call closed 15 Feb. 2016
- 9 proposals reviewed from 6 CORDEX regions
- Details: www.cordex.org
Flagship Pilot Studies (FPS)

Five now established:

- **EUR+MED**: High resolution convective phenomena
- **EUR**: Impact of land use changes
- **S. AM**: Extreme precipitation events.
- **MED**: Role of natural and anthropogenic aerosols
- **MED**: Role of air-sea coupling and small-scale ocean processes

Three we will work with further.

More recent round of FPS proposals under review.
CORDEX Statistical and Dynamical Downscaling: Workshop Series

- Advancing each for climate information
- Coordinating comparison of methods: advantages of each?
- Exploration of hybrid approaches
CORDEX – A CMIP6 Diagnostic MIP

Primary CMIP6 Question Addressed:
How can we assess future climate changes given climate variability, predictability and uncertainties in scenarios?

Primary WCRP Grand Challenges Addressed:
1. Weather and climate extremes
2. Regional climate information (status?)

Coordination: ScenarioMIP, HighResMIP, VIACS AB, . . .

CORDEX – IPCC Interest

CORDEX Coordinated Output for Regional Evaluations (CORDEX CORE)

• In development
• Motivated by
  • IPCC Workshop on Regional Climate (Sept. 2015)
  • WCRP Scoping Workshop on a framework for reg. studies (Oct. 2016)
• Elements
  ◆ Succinct set of downscalings for each region
  ◆ Provide a core foundation for additional work by others
  ◆ Span plausible range of climate change => 3 distinct GCMs?
  ◆ CMIP5? CMIP6? Historical + RCP8.5?
  ◆ Downscaling: 3-4 RCMs? ESD methods?
  ◆ Resolution?
CORDEX – Opportunities & Challenges

SPARC
- tropical convection
- high latitude storm tracks
- Arctic tropopause?

GEWEX
- subdaily precipitation

Issues
• progress very uneven across the regions
• linking the region’s CORDEX activities with other programs
Thank You!

WCRP-CORDEX